

SELF-INJURIOUS BEHAVIOR AMONG ADOLESCENTS: PREVALENCE AND THE ROLE OF CYBERBULLYING

PhD thesis

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1. Introduction

Self-injurious behavior (SIB) occurs when an individual intentionally inflicts damage to the surface of their body (1). It can be considered as a spectrum of behaviors: at one end there is nonsuicidal self-injury (NSSI), a deliberately and directly damage without suicidal intent, and at the other end is suicidal attempt, when individuals have intent to die, and it is a form of suicidal behavior (2-4). Several further terminology can be found in the literature which describe similar phenomenon as NSSI, such as deliberate self-harm (DSH), self-injury, self-harm, self-cutting or parasuicide (2). NSSI was included in the Diagnostic and Statistical Manual of Mental Disorders 5th Edition's (DSM-5) Conditions for Further Study chapter (5) in 2013 as a separate category for the first time. It is often very hard to define, whether the individual, who had SIB had suicidal intent at the time of the SIB, because individuals with SIB do not always remember to the whole act, and to their feelings in the meantime (3, 6). Moreover, a nonsuicidal act can become suicidal over time: the more often and in more ways someone self-harm, there is greater likelihood of a suicide attempt (3, 6). The coexistence of NSSI and SA is approximately 70% in clinical (3, 7) and 50% in nonclinical population (8). NSSI has a high prevalence in mental disorders as well (7, 9).

There is an increasing interest in the prevalence of SIB, especially among adolescents: the prevalence of SIB is very high in clinical population (7, 10-12), but there are conflicting results about the exact prevalence in population-based samples (13-15). Most of the studies agree on the prevalence of SIB is significantly higher among females (16-18), while others did not report this difference (19, 20), or even report higher prevalence among males (21-25). Where higher prevalence was found among boys, they suggest mostly cultural differences (21-25). There are conflicting results about the prevalence of SIB in the 21st century, both in the risk factors, definitions, gender, and continental differences as well (16, 17, 19, 26, 27).

Cyberbullying (CB) is a type of bullying, when the harassment takes place online (e.g., on Facebook, TikTok, Instagram, YouTube, online games) or on any electronic communication interface (e.g., phone call, messages) (28, 29). It has many similarities with traditional bullying, such as the repetitive tendency, the aggressiveness, and the display of power between the individuals (28). Moreover, in many cases the same person is bullied in both ways (28, 30-33). The lifetime prevalence of CB is 10-20% among adolescents (28, 31, 34-36). Previous studies found, that the prevalence of CB is higher among girls (30, 33, 35-39). Adolescents, who engaged in CB – both perpetrators and victims – experience more emotional stress and has a greater risk for school-related and mental health problems (40, 41). Moreover, CB increases the

risk of suicidal behavior, due to the adolescents who report CB are more likely to report suicidal ideation, plans and attempts (33, 35, 40, 42).

Even though the relationship between traditional bullying and SIB has now been extensively researched (43-46), the associations between CB and SIB has only in the past decade begun to attract the interest of researchers (47, 48). Some of the studies found significant negative association between CB and SIB (32, 38, 49), while others found this correlation when the CB occurs with traditional bullying (39). There are only a few research done about the relationship between NSSI and CB, which found significant higher frequency of NSSI among CB (50, 51), and that the correlation between NSSI and CB victims was partly moderated by higher scores on dysfunctional cognitive patterns, and depressive symptoms (52).

2. Objectives and Hypotheses

2.1. The first study

The aim in the first study was to conduct a systematic review and meta-analysis on the topic of prevalence of SIB among adolescents. Our hypotheses were the following:

- 1) Between the period examined, the prevalence of SIB did not change over time.
- 2) The prevalence of SIB is significantly higher among girls, than boys.

Additionally, we searched for the differences between:

- the definitions of SIB.
- the assessments used for measuring SIB.
- the place of data collection of the included studies.

2.2. The second study

The second study was a cross-sectional study about the relationship between NSSI and CB. Our hypotheses were the following:

- 1) The prevalence of NSSI is significantly higher among those who are involved in CB (whether perpetrators, victims, or bystanders) than among those who are not involved in CB.
- 2) Depressive disorders mediate the association between NSSI and CB among perpetrators.
- 3) Anxiety disorders mediate the association between NSSI and CB among victims.
- 4) The prevalence of NSSI is significantly higher among CB perpetrators and victims than among those who merely witness CB.

The first study was published in the European Child and Adolescent Psychiatry journal (53); the second study was published in the Scandinavian Journal of Child and Adolescent Psychiatry and Psychology (54).

3. Methods

3.1. The first study

The first study was a systematic review and meta-analysis. The literature search was made on the 18th of June 2020, we used six online databases: Web of Science, Scopus, OVID Medline, PubMed, EBSCO Discovery Service for Semmelweis University and PsycINFO. We excluded the clinical trials, case reports and reviews, and included English articles which provided prevalence data on SIB among populational sample of adolescents, published between 1st of January 2015 and 18th of June 2020. The methodology of this review was followed by the PRISMA guidelines. Of the 374 papers that we found, finally, we included 97 to our meta-analysis. We coded the information from the articles, with an interrater reliability ranging between 73 and 100%. Risk of bias was assessed based on the Cochrane Risk of Bias Tool. We extracted prevalence rates separately for boys and girls whenever the original study allowed. For longitudinal studies, we coded data across all time points; however, if gender-specific data existed for only one wave, we restricted our inclusion to that wave. When faced with multiple papers using the same database, we selected the version offering gender breakdowns, the largest sample, or the most comprehensive follow-up. To minimize missing data, we reached out to the primary authors. If authors did not respond, missing prevalence scores were handled through imputation. In these cases we used a procedure similar to Protzko et al. (2020) (55). In studies that only provided the age group, the average age was calculated as the geometric mean of the age group (55). In studies where the year of data collection was not reported, two years were subtracted from the year of publication (55). To conduct analyses, we used the Comprehensive Meta-analysis Software (56, 57).

3.2. The second study

The second study was an empirical, cross-sectional study. We started the data collection after the ethical approval of the Medical Research Council's Committee on Scientific and Research Ethics, Hungary. The ethical approval number is 42020-4/2019/EKU, and IV/8167-3/2020/EKU (extension after the pandemic). After detailed written and oral information, the adolescents and their parents signed informed consents. The ethical approval and prior anonymity were ensured by a code-decode system. The questionnaires and interview were filled in anonymously, and only the participant's code number were included in them. In the case of

an acute risk of suicide, the parents and adolescents were informed and referred to a child and adolescent psychiatrist within 24 hours. We conducted our study in a populational sample of adolescents in secondary and vocational schools. Inclusion criteria were the following: aged between 13 and 18 years, speaking Hungarian, be able to read the questionnaires and answer all the questions. Exclusion criterion was the inability to complete the self-administered questionnaires for any reason, e.g., not Hungarian mother tongue, inability to complete the test. To measure NSSI we used the Hungarian translated and validated version (58) of the Inventory of Statements About Self-injury (ISAS), which was developed by Klonsky and Glenn in 2009 (59). It is a self-report questionnaire to assess functions and behaviors of self-injury. To measure CB, we used a self-report questionnaire developed by Demetrovics and Zsila in 2018, which measure the frequency of CB during the past year and identify four groups of roles: 1) victim, 2) bully, 3) both victim and bully, 4) observer, and 5) none of these (60). Depression and anxiety disorders were measured with version 7.0.2 of the Hungarian version of the Mini International Neuropsychiatric Interview – Kid (MINI-KID) (61), which is a structured diagnostic interview to assist in making DSM-5 psychiatric diagnoses for children and adolescents aged 6-18 years (62-64). Statistical analysis was conducted using R software (version 3.5.1; R Foundation for Statistical Computing, Vienna, Austria). To evaluate the first and fourth hypotheses, we used chi-square tests, with the significance threshold set at $\alpha < 0.05$. For the second and third hypotheses, we utilized regularized psychological networks, which was chosen as it offers a robust framework for modeling complex interrelations among variables without the need to pre-assign roles such as independent, dependent, or mediating variables.

4. Results

4.1. The first study

Among the 97 included studies, we identified 178 effect sizes. The overall average prevalence in the studies was 16.0% (95% CI = 14.7 - 17.4, $k = 172$), and it was a heterogeneous effect, $Q(171) = 30136.96$, $p < .001$, $I^2 = 99.43$. When assessing publication bias, while Egger's test showed significant asymmetry (intercept: -2.88, $p = .046$), the funnel plot showed a symmetric distribution based on visual inspection, which was confirmed by no imputed studies in the Duval and Tweedie's trim and fill procedure.

Data for primary studies were collected between 1998 and 2018. The year of data collection had a significant, positive effect on the 171 effect sizes (coefficient: 0.035, $p = .008$): more recent studies found larger prevalence. For further investigation, we restricted the year of data collection to 2013 and onward in order to assess the effect in the time constraints that

corresponds to the time constraints of year of publication of the present meta-analysis (2015 and onward). Data for 119 effect sizes were collected in or after 2013, the effect of year of data collection was not significant on the effect sizes (coefficient: -0.015, $p = .72$). In conclusion, the first hypothesis was partially confirmed (Figure 1).

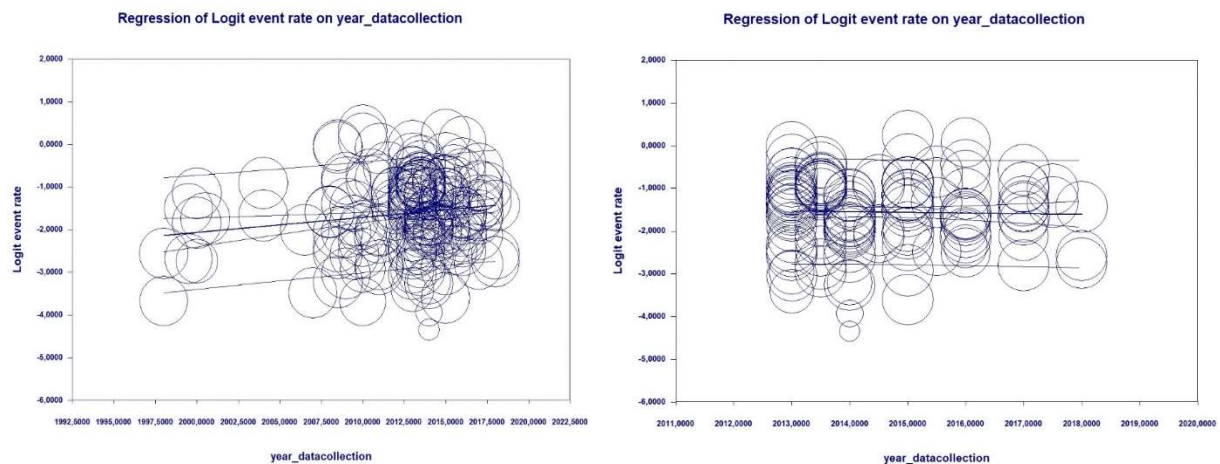


Figure 1: The scatterplots shows the differences between time period 1998-2018, and 2013-2018.

The second hypothesis was confirmed: self-harm was significantly more common among girls than boys (19.4% vs. 12.9%).

The most frequently used terms were NSSI, self-harm, DSH and deliberate self-injurious behavior (D-SIB). NSSI appeared in 60 articles, and was only used in nonsuicidal meaning, which showed an average prevalence of 18.4% (95% CI = 16.9 – 20). The term self-harm was used in 21 papers showing an average prevalence of 12.7% (95% CI = 10 – 16, $k = 34$). Only 5 articles used the term DSH (15.1%, 95% CI = 11.2 – 20.2, $k = 8$), and 5 papers used the term D-SIB (16.2%, 95% CI = 9.7 – 25.8, $k = 12$). A similar pattern was found both among females and males. Questionnaires that had been validated for SIB showed the highest average prevalence of 18.8% (95% CI = 16.8 – 20.9, $k = 79$). This pattern was confirmed when considering females samples, however the pattern was only partially confirmed for males. The most accurate estimate was obtained by pooling the studies that reported representative samples, lifetime prevalence of SIB, excluding suicidal intent, and used a validated assessment tool.

After excluding international collaborations and outliers, we compared articles from four different continents: Asia, Australia & Oceania, Europe and North America. The prevalence of SIB was significantly larger in Asian countries (19.5%, 95% CI = 17.1 – 22.2, k

= 51) than those from the other three continents (14.6%, 95% CI = 13.1 – 16.2, $k = 114$), $Q(1) = 11.20$, $p = .001$. For females, there was a tendency-level difference between prevalence estimated from Asia (22.3%, 95% CI = 19.4 – 25.4, $k = 23$) and other continents (18.5%, 95% CI = 16.1 – 21.2, $k = 50$), $Q(1) = 3.50$, $p = .061$. For males, the average prevalence estimates from Asia (19.5% (95% CI = 16.6 – 22.8, $k = 22$) was significantly higher than that from other continents (10.8% (95% CI = 8.8 – 13.2, $k = 48$), $Q(1) = 20.54$, $p < .001$ (Figure 5).

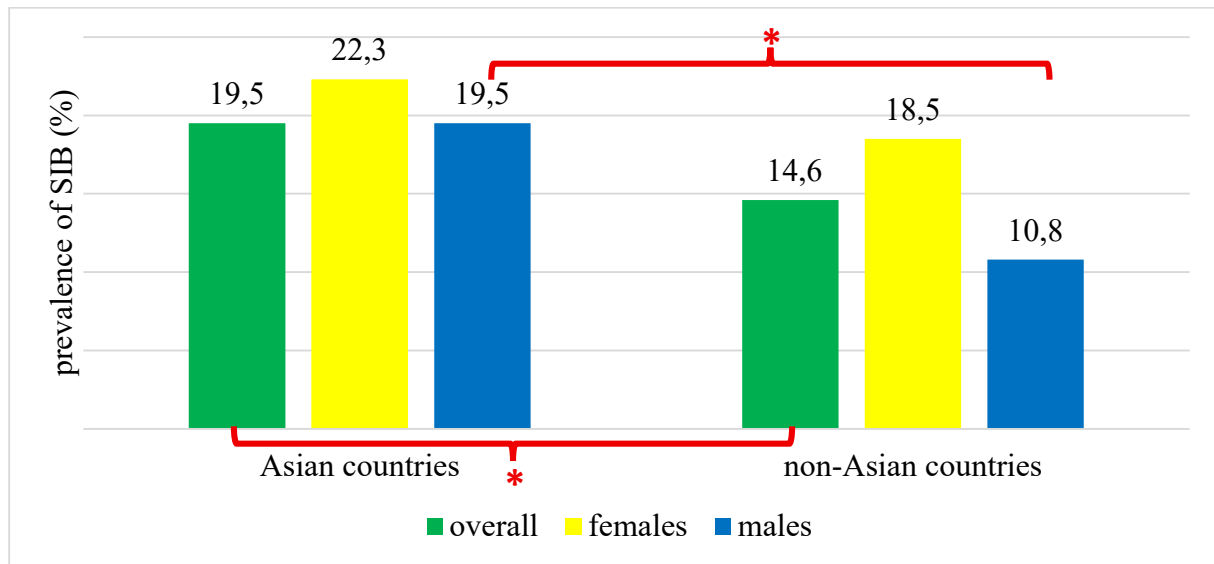


Figure 2: The continental differences about the prevalence of SIB, if we compare Asian publications with non-Asian ones (*shows the significant continental difference between overall and male samples).

4.2. The second study

Altogether, 183 participants provided written informed consent. Due to dropouts (i.e., those who stopped participating or were not available for data collection despite their prior consent, for instance were missing from school or did not respond to calls) and missing data, overall, 119 participants were included in our analysis (female 70%, male 30%, age $M = 15.73$, $SD = 1.17$). The overall prevalence of CB and NSSI were 61.3% and 62.2% respectively. The first hypothesis was confirmed: the prevalence of NSSI was significantly higher among those who were involved in CB, compared to those who were not involved in CB, $\chi^2(1) = 5.62$, $p = .02$. We found that 27.4% of the adolescents involved in CB were both victims and perpetrators, and only one adolescent was only a perpetrator without being a victim. Due to the low prevalence of the bully category in the sample (only one person indicated that they were a bully only), this variable could not be used in the network models and was therefore grouped together with the bully and/or victim variable.

Our network model suggested that the association between CB and NSSI was mediated by anxiety: being a victim was associated with being diagnosed with anxiety, $OR_{non0} = 1.36$, $CI95_{non0}[0.55, 2.40]$, $prop0 = 0.23$, and anxiety disorder was directly related to NSSI, $OR_{non0} = 1.25$, $CI95_{non0}[0.54, 2.32]$, $prop0 = 0.29$. By contrast, depression was not directly related to CB, only to anxiety, $OR_{non0} = 1.12$, $CI95_{non0}[0.49, 2.03]$, $prop0 = 0.29$, thus the second hypothesis was not confirmed (Figure 3).

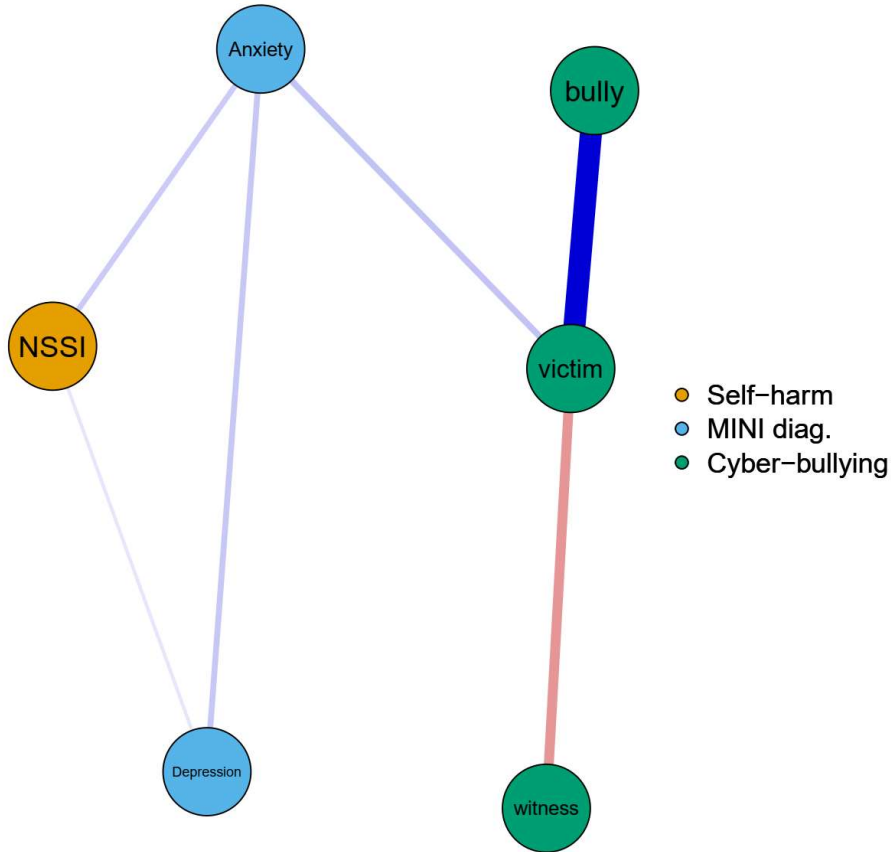


Figure 3: Association between NSSI, mental disorders (i.e., anxiety, depression), and CB (victim, bully, and witness groups): Anxiety = anxiety disorders (according to MINI diagnosis), Depression = depressive disorders (according to MINI diagnosis), NSSI = nonsuicidal self-injury, bully = CB perpetrators, victim = CB victims, witness = CB witnesses. Previously published by the candidate in Farkas et al. 2025 (54).

The third hypothesis was confirmed: victimization (from either witnessing or being a bully) was positively related to anxiety, $OR_{non0} = 1.47$, $CI95_{non0}[0.70, 2.56]$, $prop0 = 0.30$, which, in turn, was positively associated with NSSI, $OR_{non0} = 1.25$, $CI95_{non0}[0.55, 2.33]$, $prop0 = 0.29$. Depression mediated, again, only the direct effect of anxiety, $OR_{non0} = 1.13$,

CI95_{non0}[0.55, 1.96], prop0 = 0.32 for the first path, and OR_{non0} = .87, CI95_{non0}[0.41, 1.67], prop0 = 0.62 for the second path (Figure 4).

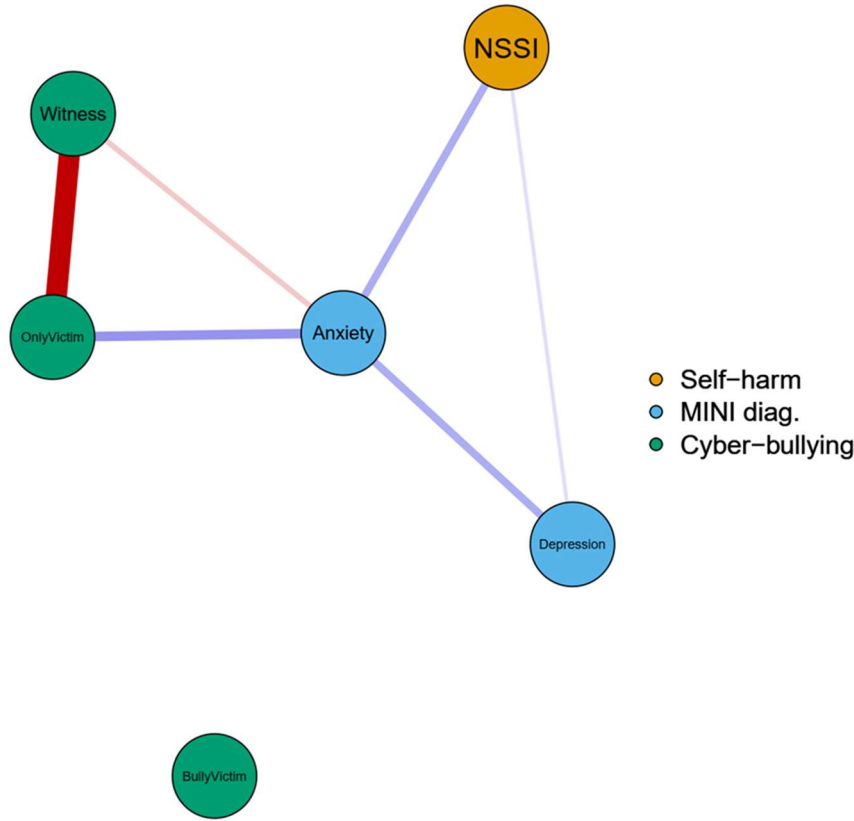


Figure 4: Association between NSSI, mental disorders (i.e., anxiety, depression), and cybervictimization: OnlyVictim = CB victims, BullyVictim = both CB victims and bullies, Witness = CB witnesses, Anxiety = anxiety disorders (according to MINI diagnosis), Depression = depressive disorders (according to MINI diagnosis), NSSI = nonsuicidal self-injury. Previously published by the candidate in Farkas et al. 2025 (54).

Finally, our fourth hypothesis was not confirmed: the prevalence of NSSI was not significantly higher among CB perpetrators and victims compared to witnesses, $\chi^2(1) = 0.68$, $p = .41$.

5. Conclusions

The findings of my doctoral work – the meta-analysis and the quantitative study – highlight the high prevalence of both CB and NSSI among adolescents. Given that adolescence is a particularly sensitive and formative period in life, young people must receive special attention through effective prevention and intervention strategies addressing both phenomena.

While the meta-analysis did not detect a significant increase in SIB between 2013 and 2018, the COVID pandemic likely influenced further trends. The second study, conducted during the pandemic, revealed elevated rates of NSSI and CB, possibly due to increased screen time, social isolation, heightened stress, and reduced access to adaptive coping mechanisms. The particularly high prevalence observed in Hungary during the second study may also reflect broader sociopolitical polarization, which can intensify minority stress and increase vulnerability to mental health problems and self-harm, especially among marginalized groups. The first study of my doctoral work emphasized elevated SIB rates among Asian male adolescents and the high incidence of NSSI among females, which highlight the importance of culturally and gender-sensitive approaches. The second study highlights that adolescents who witness CB are also at increased risk for NSSI, suggesting that prevention programs should address not only perpetrators and victims but also bystanders. The findings additionally highlight the need to extend prevention not only clinical diagnosis, but with subthreshold depressive and anxiety symptoms, as these are linked to reduced quality of life, increased NSSI and suicide risk.

The results of my doctoral work draw the attention of decision makers and healthcare professionals to the importance of school-based prevention programmes and in particular the high prevalence of NSSI and CB during adolescence. Adolescents are frequently exposed to various stressful events, but if they are given timely access to professional support and intervention, the likelihood of developing more severe psychiatric problems later in life could be significantly reduced.

Finally, I would like to draw clinicians' attention to the high prevalence of CB among adolescents, which is associated with significant anxiety and depressive symptoms and, consequently, an increased risk of NSSI. Given the strong link between NSSI and suicidal behaviour, adolescents who engage in NSSI should receive interventions as soon as possible to reduce suicide risk. Approximately one in six adolescents worldwide report a history of self-harm. Given the high prevalence of self-harm, interventions that enhance adolescents' emotional regulation should be implemented at the onset of puberty, when self-harm most commonly begins.

6. Bibliography of the candidate's publications

6.1. Publications on which the thesis is based

1. **Bernadett Frida Farkas**, Zsófia K. Takács, Nóra Kollárovics, Judit Balázs (2023) The prevalence of self-injury in adolescence: a systematic review and meta-analysis. European Child and Adolescent Psychiatry, PMID: 37486387

IF: 4.9

2. **Bernadett Frida Farkas**, Dóra Győri, Dániel Komáromy, Péter Garas, Nóra Kollárovics, Lili Olga Horváth, Judit Balázs (2025) The association between cyberbullying and nonsuicidal self-injury: the mediating role of depression and anxiety. Scandinavian Journal of Child and Adolescent Psychiatry and Psychology, 2025 Dec 10;13(1):139-150.

IF: 1.0

6.2. Publications independent of the thesis

1. Dóra Győri, **Bernadett Frida Farkas**, Lili Olga Horváth, Dániel Komáromy, Gergely Mészáros, Dóra Szentiványi, Judit Balázs (2021). The Association of Nonsuicidal Self-Injury with Quality of Life and Mental Disorders in Clinical Adolescents – A Network Approach, International Journal of Environmental Research and Public Health 18(4) 1840.

IF: 4.614

2. Dóra Szentiványi, Lili Olga Horváth, Kjeldsen Anne, L Buist Kirsten, **Bernadett Frida Farkas**, Gyöngyvér Ferenczi-Dallos, Péter Garas, Dóra Győri, Ágnes Győrfi, Dóra Győrfi, Ravens-Sieberger Ulrike, Judit Balázs (2021). Coronavirus Pandemic - #STAYHOME: How Are You Holding Up? Questions And Tips For 11-18-Year-Olds To Make It Better, Neuropsychopharmacologica Hungarica 23(1): 208-214.

IF: 0

3. Luca Katzenmajer-Pump, **Bernadett Frida Farkas**, Balázs András Varga, Johan M. Jansma, Judit Balázs (2021) Low level of perfectionism as a possible risk factor for suicide in adolescents with attention-deficit/hyperactivity disorder. Frontiers in Psychiatry, 12 (1561)

IF: 5.435

4. **Farkas Bernadett Frida**, Ferenczi-Dallos Gyöngyvér, Garas Péter, Győri Dóra, Horváth Lili Olga, Katzenmajer-Pump Luca, Keresztény Ágnes, Kollárovics Nóra, Komáromy Dániel, Mészáros Gergely, Miklós Martina, Roszik-Volovik Xénia, Szentiványi Dóra, Velő Szabina, Balázs Judit (2021) Gyermekkori pszichés zavarok kutatócsoport friss eredményeinek bemutatása. *Psychiatria Hungarica*, 36: Különszám pp. 84-96., 13 p.

IF: 0

5. Xénia Roszik-Volovik, Anna Paula Brandao, Nóra Kollárovics, **Bernadett Frida Farkas**, Eszter Frank-Bozóki, Lili Olga Horváth, Zsuzsa Kaló, Lan Anh Nguyen Luu, Judit Balázs (2023) Research group as helpers due to the war in Ukraine: Focus group experiences of women researchers. *Frontiers in Psychiatry*, 14:1139252.

IF: 3.2

6. Dóra Győri, **Bernadett Frida Farkas**, Dániel Komáromy, Lili Olga Horváth, Nóra Kollárovics, Péter Garas, Judit Balázs (2023) The Association between Nonsuicidal Self-Injury and Perfectionism in Adolescence: The Role of Mental Disorders. *European Journal of Investigation in Health, Psychology and Education* 13 (11): 2299-2327.

IF: 3.0

7. Susan Jane Young, Nóra Kollárovics, **Bernadett Frida Farkas**, Tímea Torzsa, Rebecca Cseh, Gyöngyvér Ferenczi-Dallos, Judit Balázs (2025) Acceptability and Pilot Validation of the Diagnostic Autism Spectrum Interview (DASI-2) Compared with Clinical and ADOS-2 Outcomes. *Children (Basel)*, 12(8): 1025.

IF: 2.1

Σ IF: 24.249

Independent citations: 112

Hirsch index: 3

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